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ABSTRACT

INDIVIDUALLY PRESCRIBED INSTRUCTION, THE AUTOMATED LEARNING MANAGEMENT SYSTEM, COMPUTER ASSISTED INSTRUCTION, AND THE INTERACTIVE SYSTEM ARE DISCUSSED IN A GENERAL WAY IN THIS PAPER THAT, NEVERTHELESS, DESCRIBES THE STATE OF THE ART. ALTHOUGH THESE FOUR DEVELOPMENTS, TREATED AS FOUR MODES IN THE SAME PROCESS, ARE CONSIDERED TO BE A MAJOR BREAK FROM TRADITIONAL EDUCATION, THE IDEA THAT INSTANT CHANGES IN EDUCATION ARE POSSIBLE IS REPUDIATED. ADMINISTRATION AND THE SOCIAL AMBIENCE OF SCHOOLS MUST BE CHANGED, MORE BASIC RESEARCH NEEDS TO BE DONE, A GREAT DEAL MORE MONEY MUST BE SPENT, AND INCREASINGLY, NEW AREAS OF EFFORT ARE GOING TO HAVE TO BE PRECISELY DEFINED. UNIVERSITIES WILL THEN BE FORCED TO ACCEPT THE NEW DISCIPLINES. (GO)

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TOWARD AUTOMATED LEARNING

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TOWARD AUTOMATED LEARNING*

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TOWARD AUTOMATED LEARNING

The word symposium has been aptly defined as a conference where opinions are discussed and gathered on selected subjects. Since opinions are free, a symposium should move readily toward open discussion.

At the outset of this paper, several things need to be stated in order to set a stage that will enable the listener (or reader) to avoid misunderstanding the direction of the paper, as well as the common mission of Research for Better Schools, Inc. It is intended that the paper will treat in a general way the following major points, each of which will be traced in successive steps:

Mode 1 - Individually Prescribed Instruction - the break from the traditional classroom setting

Mode 2 - Automated Learning Management System

Mode 3 - Computer Assisted Instruction

Mode 4 - Interactive System

Research for Better Schools, Inc. (RBS), one of twenty regional educational laboratories, has as its major mission the individualization and humanization of learning. It is readily conceded that the mission is large and the definitions at times fuzzy. Nevertheless, RBS has made major beginnings in each of the above four modes.

Mode 1 - Individually Prescribed Instruction (IPI) is a major break from the traditional classroom setting. Indeed, at stake is a completely new instructional role for the teacher. All too often in the past the teacher has served as the final authority and as a dispenser of information to students. In contrast, IPI is organized so that the teacher becomes an organizer of a system for instruction,

a diagnoser of learning problems, a prescriber of instructional remedies, and a coordinator of educational helps to the learner.

Perhaps an over exaggerated definition of IPI would be to state that it is the utilization of humans to simulate in a manual paper mode that which can be accomplished by the computer and the best of our automated technology.

Little doubt remains in the minds of those who have invented and experimented with IPI that we are talking about an evolutionary approach in education,(1) an approach which ultimately will take full advantage of research and development techniques as well as the emerging technologies.

The best published operating description of IPI was contained in the 1966 Yearbook of the National Society for the Study of Education, Part 2 - as written by two of its inventors, John Bolvin and Maury Lindvall from the Learning Research and Development Center at the University of Pittsburgh. The following remarks are abstracted from the operating principles developed by the above authors.

Individually Prescribed Instruction is an example of the application of the principles of programmed instruction to curriculum development in the elementary schools. This leads to certain basic assumptions underlying the IPI theory.

1) IPI is the idea that learning is something that is ultimately personal and individual - learning takes place only on an individual basis.

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(1) Glaser, Robert. "Adapting the Elementary School Curriculum to Individual Performance." Address delivered at the 1967 Invitational Conference on Testing Problems, New York, 28 October 1967.

2) Curriculum sequences must be developed in such a way that they represent a long term development process which ignores guidelines.

3) If pupils are progressing individually, questions about grouping, classification, or housing are irrelevant.

The following eight points were critical in the Implementation of Essential Structural Elements of Individually Prescribed Instruction:

1) A first step in the development of a program must be the clear and specific definition of the objectives that the pupils are expected to achieve.

2) The development of a program requires that the behaviors that lead to terminal behaviors are carefully analyzed and sequenced in a hierarchical order such that each behavior builds on the objective immediately below it in the sequence and is prerequisite to those that follow it.

3) The actual instructional content of a program consists of a sequence of learning tasks or activities (e. g. , frames, steps), through which a student can proceed with little outside help, and provides a series of small increments in learning that enables the student to proceed from a condition of lack of command of the terminal behavior to that of command of it.

4) A program permits a student to start at that level at which his present ability and achievement indicate that he is functioning and permits him to move on from that point.

5) In the use of a program, each pupil can usually proceed independently of other students and can learn at a rate best suited to his abilities and interests.

6) A program requires active involvement and response on the part of the pupil at each step in the learning sequence.

7) A program usually provides for rather immediate feedback to the student concerning the adequacy of his performance on each frame or element in the program.

8) A program is subjected to continuous study by those responsible for it and is regularly modified in the light of available evidence concerning pupil performance.

At the present time, Research for Better Schools, Inc., working closely with the Learning Research and Development Center, has been field testing the IPI Math system in 27 schools across the country. To date there are problems still needing resolution but the basic assumptions of IPI as originally invented have been proven sound.

By way of summary the IPI Math Program contains over 400 instructional objectives, placement tests, pre-tests, curriculum content materials, and post-tests. The subjects of reading and science are also underway.

Mode 2 - Automated Learning Management System

Several papers are being presented at this symposium dealing with instructional management systems. While the strategy for arriving at such systems, and the terminology as expressed by various authors may differ, Research for Better Schools has indeed started down this trail in cooperation with the Learning Research and Development Center. RBS uses Automated Learning Management Systems (ALMS), because we need more money. In reality we are dealing with the management of instruction.

Data has been collected on approximately 8,000 children, both experimental and control, in order to develop the full utilization of a computer terminal for the

classroom teacher. Two broad areas of concern are at the base of developing such a system: how do teachers make prescriptions for youngsters? how do teachers diagnose the learning difficulties that youngsters may be having. Hopefully teachers will begin to ask pertinent questions about youngsters and researchers will develop the necessary information files for the teacher.

Achievement tests offer us a systematic way of looking at a student's behavior. Administrators, teachers, guidance counselors and many others all employ test results in some way for the general purpose of improving instruction. The kinds of evaluation each group seeks answer different questions. Some ask, "How good are the schools in the Nation?" This is national assessment. Others ask the question, "How does my school district compare with similar districts?", to get information for the community and Board of Education. A question such as, "What has been the trend for the last five years in pupil achievement of social studies?", helps in identifying areas requiring improvement.

The above questions are very different from the kinds asked by the classroom teacher. Measuring educational outcomes and comparing the results with regional norms or national averages are not very useful to a teacher in a classroom with thirty plus very different students.

The teacher asks:

1. What can this student do?
2. What are the things he cannot do?
3. How is he progressing in his assigned work?
4. What difficulties is he encountering in his assignment?

5. What is the evidence that he will experience success in his next assignment?
6. Is he ready to learn something new?

The student himself uses testing to answer his questions:

1. What am I supposed to learn?
2. How am I doing?
3. What is giving me trouble?
4. What help must I ask for?
5. Can I do this as well as everybody else?

Answers to these questions can be extraordinarily helpful to the teacher in guiding the educational development of the student and in measuring the effectiveness of instruction. Students are motivated by the answers which frequently function to establish a readiness and receptivity to learning something new. This information also helps the student increase his independence in working towards a well-defined target.

It is obvious that the test instruments used for national assessment, district comparisons, and trend studies are completely irrelevant to the questions of the teacher and student. These questions can only be answered by a work sample.

A classroom test is a work sample of all the behaviors the student must master in a given curriculum or a part of the curriculum. Student performance on this sample enables the teacher to generalize concerning progress and mastery in the portion from which the sample is drawn. Before such generalizations can be made, the classroom test must constitute a fair and representative sample of behaviors to be mastered. Unless this is the case, the test will not answer

questions about student progress. Also, it may well leave the students thoroughly confused about what they are to learn, what they are learning, and if they have learned at all.

No tests dictate what to teach. Instead, our learning goals, instructional objectives, behavioral objectives (whatever they may be called) tell us what we want to test. Each behavior to be mastered demands a suitable test or test items specially designed to measure that behavior.

Once this matching of work samples to behaviors is done, the classroom test becomes a powerful tool for diagnosing the learning needs of the students. The teacher then can place the students accurately in the curriculum, analyze the specific skills he needs to learn, monitor his progress, and determine his mastery. These four uses of the classroom test give the teacher a basis for choosing specific instructional resources to help the student master the desired behaviors.

The computer becomes a most persuasive tool in providing fast feedback to the teacher about the learner. It should be noted that this is a logical transitional state as a direct outgrowth from the existing paper model of IPI.

Mode 3 - Computer Assisted Instruction

Research for Better Schools, Inc. is in the process of computerizing the IPI Math Program. The first stage of work involves the programming of the Math Placement Tests, followed by the pre-tests, the instructional content, the curriculum embedded tests, and the post-tests. Utilizing the Philco-Ford Student Audio Visual Interface system which is currently located in four junior high schools in the Philadelphia School District, RBS has addressed itself toward the role of the computer in the presentation of information aspects of instruction.

There are some who believe that testing in and of itself is an instructional procedure. A number of outcomes hopefully will be achieved as a result of this undertaking. Perhaps the most significant outcome will be one of finding out the effects of testing on deprived junior high youngsters.

I would be remiss in not pointing out that computer assisted instruction as it generally exists across the country reaches only two levels of learning. Level one learning can be best categorized as doing something that cannot be replicated again. Indeed, you influence something so it is different after that. Obviously, this is a low level of learning. Learning level two is the process in which you change something so that you can add more or do it faster. A piece of rock or a magnet can do learning one. Animals can do learning two. From our psychological studies of learning, and most of the computer assisted instruction programs that exist in America, we have ample evidence to prove that you can take a human being and teach him to learn like an animal.

A third level, learning to learn to learn, - it can be learning to learn not to learn - is more difficult.

Mode 4 - Interactive System

At the present time, the state of the art in both technology and knowledge is of such a nature that Modes 1, 2 and to some degree 3, can be carried out, and indeed are being investigated by any number of researchers across the country. At RBS we are working on all three modes and see the interrelationship of moving in these directions.

Many researchers tend to marry Mode 2 (instructional management) and Mode 3 (computer assisted instruction). Since it has been reasonably demonstrated that

programmed texts can work there would appear to be some wisdom in separating modes 2 and 3 at least for purposes of research; although strong arguments can be built for separation, sequential, or the merging of both modes.

One could logically end a presentation with the three modes described, but this really is not the end of the RBS story. It would be a waste of resources and knowledge not to enter Mode 4 - the Interactive System.

The challenge of the interactive mode is to make the computer so reactive to the child that it becomes unique to him. What's more the content presented to the learner will consist of more than arithmetic, reading, spelling and the like.

Our aim should be to teach beyond the rock and Pavlov dog level. The learner should be exposed to the processes of learning, which in reality represents learning to learn to learn. Long after the information accumulated in our too typical learning environments is forgotten, the learner could remember the processes.

It is not unrealistic to expect that we can teach youngsters to interact in the solution of problems concerning self, vocational career choices, academic guidance, curriculum choices and the like. The techniques for such undertakings may well come from computer assisted instruction and the data from instructional management systems.

RBS has begun an intensive search for measuring instruments and content materials for the interactive mode. To date we have found a dearth of available materials. A restricted printing of twenty-six major interactive instruments has been published by RBS. Entitled "Mirrors for Behavior," it is our entry

into extending the frontiers of knowledge and experimentation.

In concluding several points are worth mentioning.

1) No magic wand is going to produce <u>instant</u> changes in education. Unless management practices in school administration and the social mileu of the schools are changed one could seriously question if any fruitful change can take place.

2) As one moves from Mode 2 through Mode 3 the need for more basic research becomes quite apparent. We cannot afford to live in an either or world. Money, in much larger quantities than in the past, must be allocated to cover the total spectrum of research and educational development.

3) As new roles emerge more accurate definitions and job descriptions will become necessary. Human engineers, educational technologists, educational developers, and goodness knows what other emerging roles are going to need newly defined disciplines. Universities will be forced into accepting these new disciplines.

Finally, let me remind you that a symposium is a collection of opinions. Hopefully I have not deviated from the definition.